

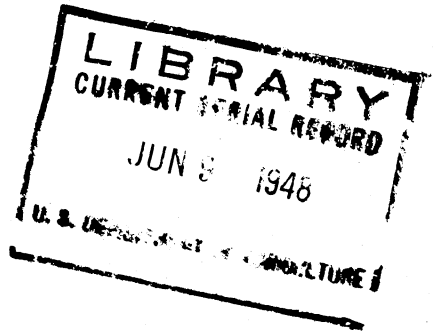
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FARMERS' BULLETIN NO. 1423

Preparation of CABBAGE for Market



U. S. Department of Agriculture

CABBAGE IS CLASSIFIED according to type as Danish, domestic, pointed, red, and savoy. The first three types are the most important commercially.

Solidity of the heads and color of outer leaves are the most reliable characteristics for determining the proper stage to harvest cabbage.

A large part of the cabbage crop is now graded and packed in accordance with the requirements of United States standards, and cabbage is rather generally quoted and sold on the basis of these standards.

Most of the cabbage for market is packed in 50-pound open-mesh sacks. In some States considerable quantities are packed in crates, the most important of which are the Los Angeles lettuce and vegetable crate, the vegetable half crate, and the melon or corn crate. Some cabbage is also marketed in bushel baskets and in 1½-bushel hampers.

Refrigerator cars are now used for most rail shipments of cabbage. Loads of cabbage in containers are usually covered with crushed or chunk ice for shipment during warm weather. Refrigeration of northern storage cabbage shipments is not necessary during the winter, but often cars are preheated.

It is estimated that more than two-thirds of the cabbage crop now moves to market by motortruck.

About one-eighth of the total commercial cabbage crop is used for sauerkraut manufacture, principally in northern producing States. United States standards for cabbage for sauerkraut manufacture were issued in 1932.

A large percentage of the Danish crop of cabbage is stored in northern producing States for supplying the markets during the winter.

Federal-State inspection of shipments of cabbage is available for a small fee to financially interested parties in most of the commercial cabbage-producing areas, and Federal inspection is available at receiving markets.

PREPARATION OF CABBAGE FOR MARKET

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Cabbage, one of the important vegetable crops in the United States, is grown commercially in about 30 States.¹ An average of 201,154 acres was grown in the 5-year period 1943-47, and the average production on this acreage for the same period totaled 1,459,600 tons. The farm value of the cabbage crop in 1947 was estimated to be \$47,080,000 and has averaged \$45,944,000 for each of the last 5 years. The demand for high-quality cabbage by consumers has made it necessary for growers to give close attention to the marketing of this crop.

MARKET TYPES OF CABBAGE

Cabbage may be classified commercially into five distinct types: Danish, domestic, pointed, red, and savoy. This classification is based entirely upon terms adopted by the trade and has no direct connection with horticultural varieties or the regions where grown. The first three types have the greatest commercial importance.

The term Danish or Hollander is commonly applied to the solid-headed, late-maturing cabbage, which is generally used for storage and late-marketing purposes. Heads of this type usually have the leaves closely compacted and overlapping at the crown. They are comparatively smooth and solid around the base between the midribs of the leaves, even after successive head leaves have been stripped off. The heads are usually round or oval, but at times are somewhat flattened. The outline of the head as seen from above is smooth and regular. The midribs of the outer leaves generally extend outward and upward at an angle from the stalk, so that the base of the head appears rounded or elongated.

Domestic cabbage is usually not so compact as Danish, but the

¹ For a more complete discussion of the marketing of cabbage, see Technical Bulletin No. 646, Marketing Commercial Cabbage, copies of which may be had from the Office of Information, United States Department of Agriculture, Washington 25, D. C.

heads are reasonably hard. They are flat or round, and when the crown leaf is removed the head appears somewhat angular in outline. The leaves are usually crinkled or curled and do not overlap so far at the crown as in Danish cabbage. The head is usually somewhat soft at the base between the midribs of the leaves. The leaves tend to form a right angle with the stalk, or they even droop or curve downward slightly before curling upward to form and envelop the head. Thus they give the base of the head a flattened appearance.

The shape of the heads, particularly those of Danish type, is subject to considerable variation, dependent upon soil, climatic, or cultural conditions. At times it is difficult to distinguish heads



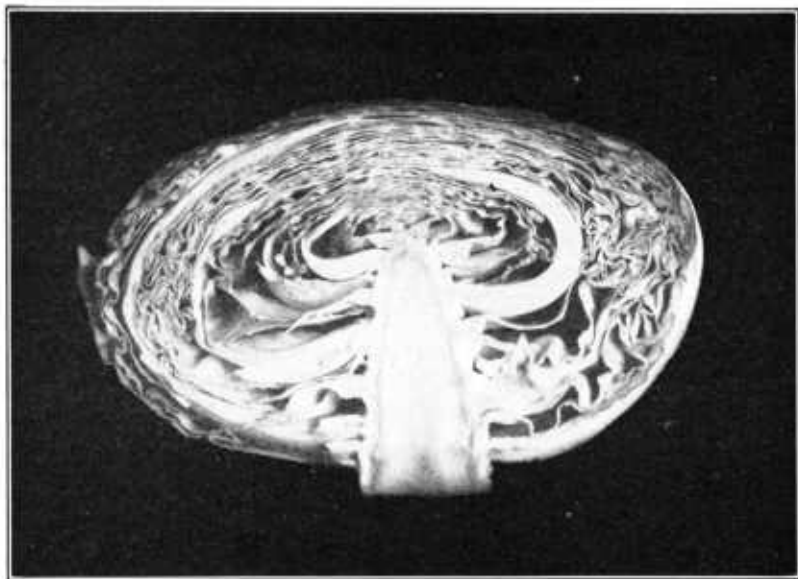
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FIGURE 1.—Cross section of typical head of Danish or Hollander cabbage. Heads are very compact. The leaf midribs extend outward and upward from the stem. In the flatter types of Danish or Hollander this is not so pronounced.

of Danish cabbage from those of domestic type when judged by the shape alone. The most accurate method of differentiation under these conditions is to base the identification largely upon the characteristics displayed by a vertical cross section through the center of the head. The typical characters of these two types of cabbage are shown in figures 1, 2, 3, and 4.

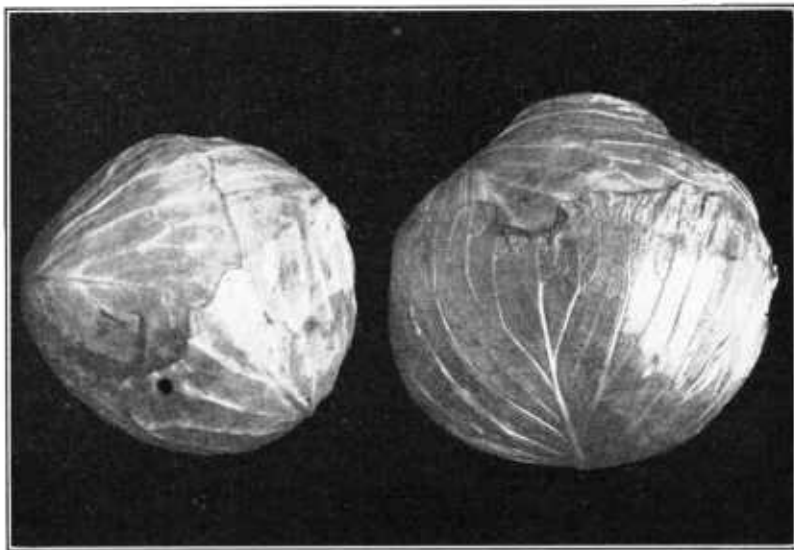
Early-maturing varieties of domestic are grown almost entirely for marketing as fresh cabbage. Late-summer or fall varieties are grown both for market and for sauerkraut purposes.²

² For a detailed description of principal varieties of cabbage see U. S. Department of Agriculture Miscellaneous Publication No. 169, Description of Types of Principal American Varieties of Cabbage. Copies may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 50 cents a copy.



PMA 4133

FIGURE 2.—Cross section of typical head of domestic cabbage. The heads are not so compactly formed as in Danish cabbage. The leaf midribs form a right angle with the stem or curve downward slightly.



PMA 4139

FIGURE 3.—Danish cabbage (left) is smoothly circular in outline as viewed from above. Domestic cabbage (right) is somewhat angular in outline.

In the North and West both Danish and domestic types are grown extensively, whereas most of the cabbage grown in the South Central States is of the domestic type.

The pointed type is readily recognized by the conical or pointed shape of the head, together with the comparatively smooth surface of the leaves. This type, formerly the leading type produced in some southeastern districts, has declined in popularity in recent years but is still grown to some extent in these districts and in the Northwest. The two most important varieties of this type are illustrated in figures 5 and 6.

The red type is known by its red or purple color. Heads of the dark-red or purple varieties are as hard as Danish cabbage, but the lighter-red varieties are only fairly hard or are comparable in this respect to the domestic round type. Red cabbage is grown to a limited extent as a field crop in a few States and as a market-garden crop near many large cities. It is used principally for pickling and salad purposes.



PMA 4127

FIGURE 4.—Three heads of Danish or Hollander cabbage, illustrating the typical round, balloon, and oval shapes.

The savoy type is grown only in small quantities. The normal crumpling or blistering of the leaf tissue throughout the leaves and head readily identify it. The heads are of a yellowish-green color and as a rule are not much more compactly formed than head lettuce, although some varieties are reasonably hard. It is a fairly important crop near New York City and on Long Island.

TIME AND METHODS OF HARVESTING

In the northern sections the solidity of the head is the usual characteristic by which the proper stage to harvest is determined, although with some varieties the color is also a factor, the crown or top of the head turning a lighter shade of green about the time of full develop-

ment. Cabbage is usually considered ready to cut when the green cover leaves begin to curl back slightly, exposing the whiter leaves beneath. Cabbage at this stage is about as hard and heavy as it will become without bursting and without being too crisp and brittle for good handling.

Cabbage grown as a truck crop frequently is harvested as soon as it has attained sufficient size to be placed upon the market, regardless of its stage of maturity. Growers, especially in southern areas, often harvest the heads while they are still soft, in order to get higher prices at the beginning of the season, but in most cases this means a considerable loss in tonnage. Moreover, the quality of the product is inferior. Shipment of such stock is likely to weaken the market and perhaps limit the demand, as it causes the consumer to curtail his purchases. Stock cut when soft or immature wilts badly, and when displayed for sale is unattractive in appearance. On the other hand, cabbage that is not harvested soon enough becomes over-ripe and must be closely trimmed. Such heads have a white appearance and are very tender. They are too brittle for long shipment.

The common practice throughout the northern cabbage sections is to allow the crop to stand until all of it can be harvested at one or



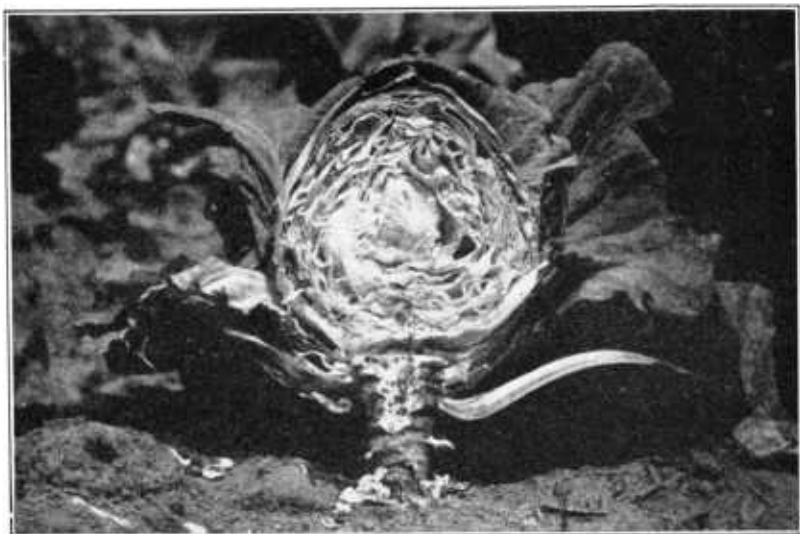
PMA 4126

FIGURE 5.—The head on the left is Charleston Wakefield. The abruptly pointed head on the right is Jersey Wakefield.

two cuttings. Throughout the South and those sections that supply the midseason market, two or more cuttings are necessary, because in these districts the ripening often extends over a long period.

In the northern districts, the harvesting of Danish or Hollander cabbage often continues until the middle of November. Freezing temperatures may occur before the harvesting is completed. The outer leaves which show evidence of freezing injury are trimmed off before the cabbage is loaded. In case the freezing extends into the head, cutting should be discontinued for a time. If favorable weather follows, the heads will thaw, and may show no evidence of injury when the outer leaves are trimmed off.

The most common method of harvesting is to sever the head from the stem with a large butcher knife (fig. 7). Some growers use



PMA 4124

FIGURE 6.—Cross section of head of Charleston Wakefield cabbage. The air spaces between the leaves are typical of this variety.



PMA 4163

FIGURE 7.—Common method of harvesting is to sever the head from the stem with a large butcher knife.

hatchets, long-handled spades, tobacco shears, or knives of various descriptions, commonly patterned after the semicircular chopping

knife or meat cleaver. In some sections a long-handled, spadelike knife known locally as a spud, is a popular harvesting tool (fig. 8).

Cutting tools with long handles permit the harvesting to be done with comparative ease and rapidity, but are not conducive to careful work, as many of the heads are cut either with too long a stem or with part of the base chopped off. The use of a heavy knife is more satisfactory. Heads with deep slices cut off at the stem end, and with the loose outer leaves falling readily from the heads, detract from the good appearance of a carload, to say nothing of increasing the likelihood of decay.

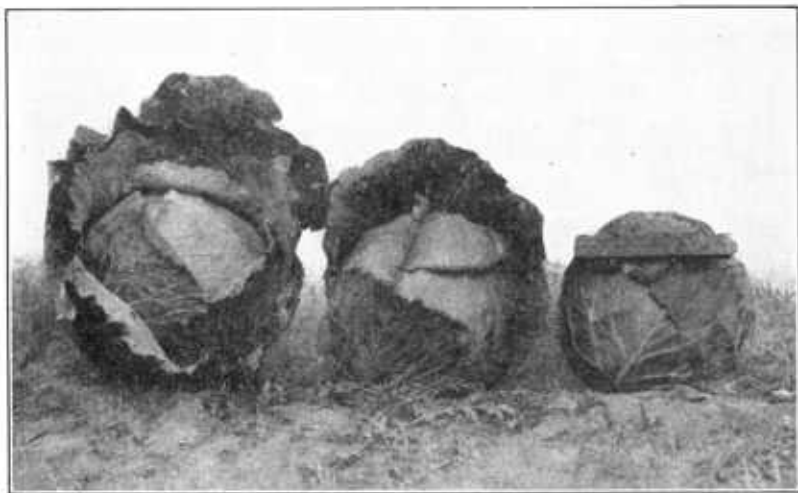


FIGURE 8.—The long-handled spadelike knife permits harvesting with comparative ease but is not conducive to careful trimming.

Cabbage intended for immediate shipment should be trimmed to the desired number of wrapper leaves. Most of the southern new cabbage is now shipped with four to seven green wrapper leaves attached, as illustrated by the head on the left in figure 9. Late-crop cabbage, however, is usually trimmed to not more than four closely fitting wrapper leaves. Any leaves showing material damage from worms, disease, or other cause should be removed even though this means close trimming. The green outer leaves protect the heads. They can be removed at destination if this is necessary to give the lot a fresh appearance. Stems should be one-quarter to one-half inch in length.

In harvesting late-crop cabbage the usual procedure is to cut and trim the heads at one operation, putting the heads from two or more rows into one windrow. Some growers then collect the heads in field containers, after which they are loaded on a wagon or truck and hauled from the field (fig. 10). Many growers prefer to load in

bulk from the field. The conveyance is drawn between the windrows, and one person on the ground tosses the heads to another on the load.



PMA 4120

FIGURE 9.—A large percentage of the southern new cabbage crop is trimmed to four to seven green wrapper leaves, as illustrated by the heads on the left and in the center; the right-hand head is closely trimmed.



PMA 4161

FIGURE 10.—In northern producing areas cabbage is sometimes hauled from the field in containers, although it is more often loaded in bulk.

When loading closely trimmed heads in this way care should be exercised to prevent bruising. Bruised tissues become watery in

appearance and later turn dark; often decay follows. The heads should not be allowed to fall into the bed of the conveyance but should be placed carefully on the load.

In many of the smaller producing districts and in sections located comparatively near market centers, containers are generally packed at the farm, either in the field or at the edge of the field, as the heads are cut. In many Southern States, as well as in some other States, it is customary to place the heads in carts that are driven ahead of the cutters. In many producing sections some growers collect the heads in field crates and haul them to the edge of the field on sleds, where the cabbage is either packed in containers or hauled to a nearby packing shed for further grading and packing (fig. 11).



PMA 416.

FIGURE 11.—In some producing sections cabbage is collected in field crates and hauled on sleds to the edge of the field, where it is either packed for shipment or loaded on a conveyance to be transported to shippers' packing sheds or loading platforms for final grading and packing.

NECESSITY FOR CAREFUL GRADING

Care should be exercised in the handling of cabbage, whether it is to be shipped in containers or in bulk. The attractiveness of a neatly trimmed carefully graded lot of cabbage pays for the extra time and attention required in the preparation.

No one factor is more important in marketing fruits and vegetables than careful grading. High standards, consistently adhered to, build good will and create confidence. It is recognized increasingly by growers and shippers that fresh, sound, firm cabbage brings higher returns than soft, puffy, leafy, or worm-eaten heads, and that it pays well to discard such defective heads before shipping (fig. 12). They should be left in the field at cutting time. The arrival on the markets of large quantities of cabbage that is poorly graded or in bad condition quickly depresses the demand. On the other hand deliveries of uniformly good-quality cabbage stimulate consumption.

A considerable part of the crop in many States that supply early and midseason cabbage is now graded and packed at shippers' packing sheds or loading platforms, usually located on railroad sidings (fig. 13). After many defective heads are eliminated in the fields



PMA 4039

FIGURE 12.—Burst heads (left) and heads showing slime (center) or bad worm injury (right) should be discarded.



PMA 4185

FIGURE 13.—Of the early and midseason cabbage crops a considerable part is hauled to shippers' packing sheds or loading platforms for final grading and packing.

by the cutters, the graders at packing sheds give the heads another final inspection before they are packed for shipment. Thus defective heads missed by the cutters are discarded, and careful work on the part of the graders enables the shipper to pack a more uniformly graded and higher-quality product.

Small or medium weight cabbage is the most desirable market size. Heads of pointed cabbage weighing 1 to 4 pounds and heads of Danish and domestic cabbage weighing 2 to 6 pounds are preferred by receivers. When loading cabbage in bulk, a certain amount of sizing can be done at the car, as most shippers in the Northern States instruct their loaders to reject all heads estimated to weigh less than 2 pounds. Heads weighing more than 8 pounds are undesirable.

Extreme irregularity in size should be avoided. Shipments from northern sections often are especially selected for size, grading "small," "medium," or "small to medium." In some cases, when the field run shows a considerable number of large heads, the largest are hauled separately. Shippers frequently load out straight cars from one field. This often results in a more uniform grade and size than if the car were loaded from several fields without grading.

When cabbage is shipped in containers it is preferable to pack small, medium, and large heads separately. Cabbage so packed as to size naturally presents a better appearance and often brings a premium when sold in the markets. Retailers who follow the practice of setting a price on each head naturally prefer fairly uniform sizes because it is easier to set a price on the heads and because uniform sizes permit the selection of containers having the sizes wanted. Many retailers now sell cabbage by the pound, in which case uniform sizing is not so important.

A large percentage of the cabbage crop is now graded and packed in accordance with the requirements of United States standards, and cabbage is rather generally quoted and sold on the basis of these standards. The standards are revised from time to time to keep abreast of new developments and changes within the industry. Copies of the latest standards may always be obtained from the Production and Marketing Administration, United States Department of Agriculture, Washington 25, D. C.

The standards in effect in 1948 for cabbage for market provide requirements for U. S. No. 1, U. S. No. 1 Green, U. S. No. 1 New Red, U. S. Commercial, U. S. Commercial Green, and U. S. Commercial New Red cabbage. The principal grade factors taken into consideration in U. S. No. 1 grade are trimming, solidity, freedom from withering, puffiness, bursting, soft rot, and seed stems, and damage caused by discoloration, freezing, disease, and insects. A provision for designating cabbage as U. S. No. 1 Green was added to the standards in 1934, when green cabbage became very popular with consumers. The requirements for this grade are the same as for U. S. No. 1 except that the heads must have at least a fairly good green color and may have as many as seven wrapper leaves.

The U. S. Commercial and U. S. Commercial Green grades for cabbage were added to the standards in 1939. The requirements for these grades are the same as for U. S. No. 1, and U. S. No. 1 Green, respectively, except that the heads need be only reasonably firm and an increased tolerance for defective heads is allowed. Most of the new cabbage from the Southern States is now packed and sold as U. S. No. 1 Green or U. S. Commercial Green.

Provisions for designating cabbage as U. S. No. 1 New Red and U. S. Commercial New Red were made in 1945. Cabbage of these grades may also have as many as seven wrapper leaves.

In addition to the quality requirements in the standards, provisions are made for classifying the cabbage as to size in connection with the grade by use of the terms "small," "medium," and "large." The size designation is dependent upon the weight of the heads and the type of cabbage.

The United States standards furnish a common terminology that may be used in describing a given shipment of cabbage, and provide a basis for contracts, sales, inspections, adjustments, etc. It may readily be seen that if a lot of cabbage is described as U. S. No. 1 Medium, a clear and definite understanding of both the quality and size of the cabbage comprising the shipment may be had by both buyer and seller without actually seeing the lot. The intelligent use



PMA 8875

FIGURE 14.—Loading a car of cabbage packed in 50-pound open-mesh sacks. This container is now the one most widely used for shipping cabbage in all but a few commercial producing States.

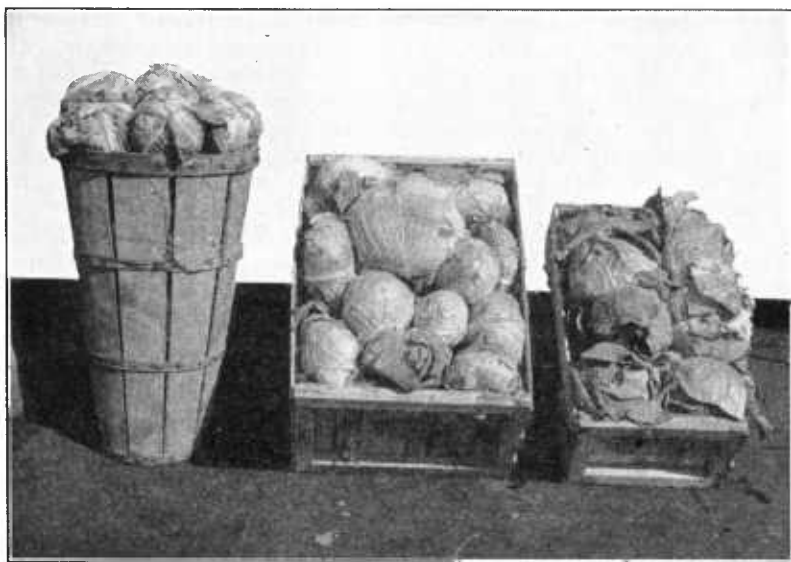
of standardized grades not only minimizes the possibilities for misunderstanding but also for fraud, deception, and sharp practice. Most of the important cabbage-producing States have adopted the United States standards for cabbage as official State standards, using them as the basis for official inspections.

CONTAINERS

Most of the cabbage produced for market is now shipped in open-mesh sacks designed to hold 50 pounds of cabbage (fig. 14). In contrast, only a few years ago most of the crop was packed in wooden crates and hampers and in some sections a considerable part was loaded

in bulk. The sudden shift to the use of the 50-pound bag was probably due to several causes such as the scarcity of lumber during the war period, the price of sacks as compared with that of wooden containers, and the development of improved methods of loading, icing, and transportation of sacked cabbage to market. It remains to be seen whether the future trend will be toward the increased use of formerly popular types of wooden containers, such as the Los Angeles lettuce and vegetable crate, generally known to the industry as the L. A. crate, the vegetable half crate, and the $1\frac{1}{2}$ -bushel hamper (fig. 15).

Sacks are suitable containers for cabbage if they are handled carefully so as to avoid the bruising of heads. The 50-pound size has a decided advantage in this respect over the 100-pound and larger sizes formerly used in some areas. Truckers and handlers are less likely to drop the lighter weight packages when loading and unloading. Cab-



PMA 4085

FIGURE 15.—Three popular wooden containers for shipping cabbage are the $1\frac{1}{2}$ -bushel hamper (left), the Los Angeles lettuce and vegetable crate (center), and the vegetable half crate (right).

bage also looks attractive in open-mesh sacks, particularly when they are made of light-green material.

The L. A. lettuce and vegetable crate is still used to some extent as a shipping container in California, Washington, Florida, Texas, Mississippi, Tennessee, Louisiana, Colorado, and possibly a few other States. The vegetable half crate is used to a lesser extent. Both crates are recognized as satisfactory cabbage containers. The L. A. crate holds from 85 to 100 pounds and the half crate about 45 pounds, depending upon type, solidity of the heads, and method of packing. Typical inside measurements for these crates are 13 by 18 by $21\frac{5}{8}$ inches and 9 by 13 by $21\frac{5}{8}$ inches, respectively.

The $1\frac{1}{2}$ -bushel hamper, once the most widely used container for the small pointed-type cabbage shipped from Florida, South Carolina,

New Jersey, and southeast Virginia, is now seen less frequently in the market centers of the East. However, some shipments, both by truck and by rail, from these eastern areas are still made in this container. The package holds from 45 to 50 pounds of cabbage and its shape is particularly adapted to close packing of pointed-type cabbage.

Other containers that are used to a small extent include the Howard crate with inside measurements of 10 by 16 by 22 inches, and another crate 13 by 13 by 22 $\frac{1}{8}$ inches, both of which are used in Georgia, and the pony crate, 13 by 16 by 24 inches inside, used almost exclusively for cabbage produced in the Spokane area of Washington. Recently some cabbage has been shipped from Mississippi and Texas in the corn or melon crate measuring 12 by 12 by 22 inches inside and holding about 50 pounds of cabbage. Another crate that has proved popular with some growers in Mississippi is a wire-bound crate with the same dimensions and capacity as the corn or melon crate.

Other containers that have assumed considerable importance recently when crate materials have been scarce are second-hand, wire-bound, 1 $\frac{3}{8}$ -bushel citrus boxes and bushel baskets. These used containers are purchased by growers and shippers from dealers in second-hand packages at the market centers and refilled with cabbage. The bulk of the market cabbage crop produced recently in Ohio has been shipped in second-hand citrus boxes. Such boxes have also been used by some growers and shippers in South Carolina, New Jersey, and other Eastern and Northeastern States. Unlidded second-hand bushel baskets are mostly used by growers in market garden areas near the large cities in the East and Middle West. Most of the cabbage packed in these two kinds of second-hand packages is transported to the markets by motortruck.

Whatever type of wooden container is used for cabbage it should be neatly and securely constructed of substantial material. Flimsy or damaged containers have a poor appearance and often necessitate extra handling and reailing after they reach the markets. Second-hand containers, if discolored or in poor repair, are not to be recommended. Buyers are not inclined to offer top prices for stock packed in unattractive containers.

Cabbage packed in crates should preferably be arranged in orderly layers with stems out. The heads should be pressed firmly but carefully into position so as to make a tight pack. Crushing and excessive bruising should be avoided. The crate should be well filled so that cover slats will show a slight bulge, thus preventing damage from shifting of the contents during handling and transit.

METHODS OF LOADING CARS

Refrigerator cars are used for most rail shipments of cabbage, although occasionally ventilated box or stock cars are used for short-distance shipments, mainly to kraut factories. Practically all shipments of cabbage made from late spring to early fall move under refrigeration. When the weather is warm, cabbage wilts and deteriorates rapidly in market quality unless kept cold and moist. During the late fall and winter, refrigeration of northern late cabbage is not necessary, but it is often advisable to protect shipments against

freezing during cold weather. Carriers' Protective Service is available on some railroads during periods of cold weather if the destination is within heater territory.

In addition to providing proper temperatures for cabbage shipments, provision should be made for adequate ventilation and free circulation of air, as these are deterrents to the development of disease organisms and other deterioration.

Methods of loading sacked cabbage depend somewhat upon custom in the various producing sections. In southern shipping areas, most cars are loaded with 25,000 pounds of cabbage, or about 500 50-pound sacks. Occasional loads from these sections range up to as many as 600 sacks. Cabbage produced in the Northern States and in the Rocky Mountain areas, and shipped mostly during the fall and winter months, is more often loaded at the rate of about 600 sacks per car.

Sacked cabbage is difficult to load in regular layers because different-sized heads cause irregular bulges on the outside of the sacks and the sacks have a tendency to roll. Generally growers and shippers follow one of two methods of stowing sacks—in one of which the sacks in the ends of the car are all placed lengthwise and in the other the sacks are placed alternately in layers crosswise and lengthwise. In each case loading between doors is more or less irregular. From late spring to early fall, when the weather is comparatively warm, most shippers build their loads around a channel of block ice extending lengthwise through the center of the car. Thus, in the load where the sacks in all layers are placed lengthwise of the car, the arrangement in the ends for a 500-sack load is usually 5 stacks 7 rows of sacks wide and 6 or 7 layers high, with irregular loading between doors. Owing to the difficulty of making sacks with bulging heads rest one above the other, many shippers load every other layer 6 rows wide, thus allowing each row of sacks above the first layer to rest in the trough made by the 2 rows of sacks under it. In the crosswise-lengthwise method of loading, the arrangement in the ends is in layers placed alternately 3 rows each side of the channel ice lengthwise and 2 rows each side of the channel ice crosswise, 6 and 7 layers high, with irregular loading between doors. In both methods of loading another layer of sacks is added for loads of approximately 600 sacks.

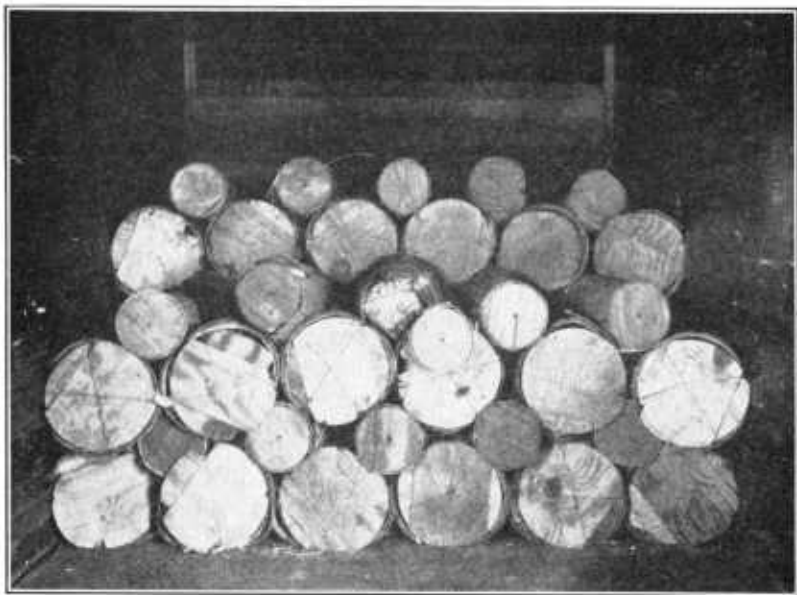
When loading crated cabbage a space of 2 inches or more should be left between the rows of packages to permit free circulation of air throughout the load. L. A. lettuce and vegetable crates filled with cabbage are commonly loaded on edge the full length of the car, 6 rows wide and 3 layers high, with about 16 stacks making a total of 288 packages per car. When it is desired to load 300 crates to the car, 2 stacks are loaded 4 layers high. Some shippers space equally 5 rows of L. A. crates across the width of the car and place them 4 layers high. The 3 lower layers are loaded on edge, whereas the top layer is placed upright with bulge up. The average refrigerator car so loaded will have about 320 packages.

Vegetable half crates containing cabbage are usually loaded 7 or 8 rows wide and 4 to 6 layers high, the count per car ranging from about 512 to 600 crates.

One and one-half bushel hampers are commonly loaded in the ends of the car, on sides, lengthwise, alternate hampers reversed, 7 rows

wide and 4 or 5 layers high. With this method of loading, often some of the containers in the bottom of the load become crushed in transit (fig. 16).

Hampers loaded on end, 2 or 3 layers high, with tops and bottoms alternating, will usually carry fairly well. The number of $1\frac{1}{2}$ -bushel hampers to the car varies from 350 to 500, depending upon the method of loading and size of the car. In Florida the usual loading is about 425 hampers.



PMA 9016

FIGURE 16.—Damage frequently occurs in transit when hampers are loaded on the sides.

Cabbage packed in Howard crates in Georgia is usually loaded full length of the car 16 stacks, 7 rows wide, and 4 or 5 layers high.

The pony crates used for packing the bulk of the crop produced in the Spokane area of Washington are ordinarily loaded full length of the car, 4 rows wide, and 4 layers high, with about 320 packages per car. Shippers in Mississippi, who use wire-bound crates and the melon or corn crates, ordinarily load them 488 packages to the car, 6 rows wide and 5 layers high. Texas shippers who use the melon or corn crate load in the same manner.

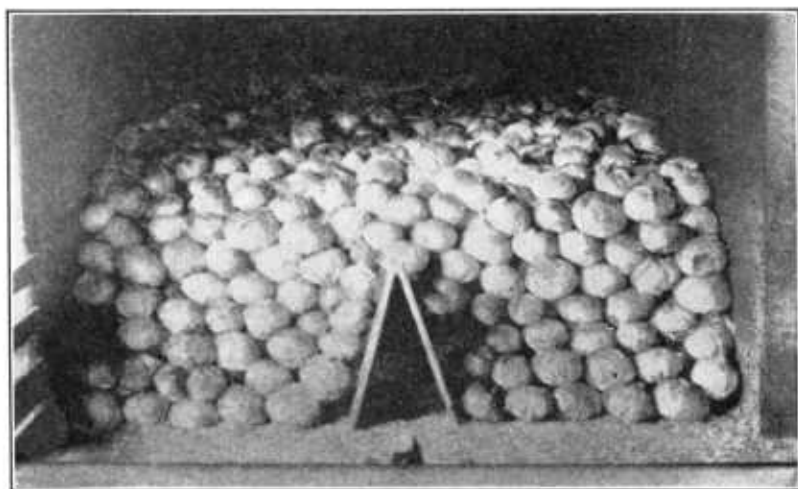
In Ohio, cabbage packed in second-hand, wire-bound citrus boxes is commonly loaded 7 rows wide and 5 layers high in the ends of the car with irregular loading between doors.

Growers and shippers during recent years have been impressed with the importance of keeping cabbage well refrigerated during transportation if it is to arrive at the markets in good condition. Therefore, it has become general practice during warm weather, particularly in southern shipping areas, to place a layer of snow or crushed ice over the tops of loads of both sacked and crated cabbage. The amount of ice used depends largely on the length of the haul and the anticipated

weather conditions of the area through which the cabbage is to be hauled. Consequently, the amount of ice used over the tops of the load may vary from 4 to 10 or more tons.

Practices also vary with respect to the use of ice in the bunkers. Often shippers rely on top ice alone to maintain the proper temperature during the transit period. During extremely warm weather, however, many shippers require in addition that bunkers be filled with ice before the cars are rolled. During the early fall months shippers in the Northern and Rocky Mountain States may rely on bunker ice alone to insure arrival of the cabbage in the markets in good condition, although they may use top ice in addition for late summer shipments.

As carlot shipments of cabbage in bulk have been gradually decreasing during recent years, now only a very small percentage of the crop, principally from the Northern and Rocky Mountain States, is loaded in bulk. Considerable quantities of cabbage, mainly from east-



PMA 4109

FIGURE 17.—An A-type ventilating frame permits free circulation of air throughout the bulk load.

ern and southern producing States in recent years, have been transported to the markets in bulk by motortruck, but it is reported that many truckers now refuse to haul cabbage unless it is packaged.

For rail shipments of bulk cabbage, during the warmer months of the year, A-type slatted ventilators should be used (fig. 17). These ventilators are constructed along the floor in the center of the car before loading begins. There is little uniformity in their dimensions, but most commonly they are $2\frac{1}{2}$ to 3 feet high and about $1\frac{1}{2}$ to 2½ feet across the base. In loading cars thus equipped, it is advisable to leave about 2 to 3 feet of the frame open at the top between the doorways to permit the free circulation of air in the car, thereby reducing the possibility of the top of the load becoming discolored during transit.

When bulk-loading southern new cabbage on which a number of green wrapper leaves are left attached to the heads it is difficult to

arrange the heads so as to make an attractive load. Shippers usually pile them in the car more or less haphazardly. However, in loading heads of well-trimmed cabbage it is considered good practice to place each head individually, carrying the cabbage back from the door in baskets or crates. This may necessitate having two men in the car, but it prevents bruising and gives the carload an attractive appearance. The load is usually built up in successive benches 3 to 5 feet in width, extending across the car. The heads are carefully arranged with stems down in such a way as to form a smooth slanting face to each bench. Cars loaded carefully in this manner are neat and attractive. In some cases only the heads forming the front of the bench are placed individually, the remainder of the bench being built up without regard to the position of the heads.

The practice of loading closely trimmed heads by tossing them haphazardly into the car causes much bruising and mechanical injury and thus increases the possibility of the development of decay in transit. Cars so loaded are unattractive in appearance.

In northern producing areas it is necessary to protect shipments from freezing injury during the cold winter months. Heater service is often employed for this purpose. For a short haul during cold weather, cars are often preheated.

SHIPMENTS BY MOTORTRUCK

During recent years the quantity of cabbage transported to market by motortruck has increased decidedly. In fact, it is estimated that more than two-thirds of the movement of cabbage to market is by truck. In some sections, notably Long Island, New Jersey, North Carolina, and Indiana, practically the entire crop is trucked to market. In many other Eastern and North Central States considerably more than half of the crop is so shipped. Because of the extensive system of highways connecting producing sections with many of the large markets, cabbage can be loaded on trucks one day and offered to the receiving trade in the markets several hundred miles away the following morning.

Since motortrucks get the cabbage to market in a relatively short time, loading precautions are not so important as with rail shipments, where the transit period is usually much longer. But truck shipments should be protected from direct exposure to the sun's rays, as such exposure will cause the cabbage to dry out and wilt. If the cabbage is crated, it is well to leave some ventilating space between the crates in the load. Bulk shipments by motortruck are usually not to be recommended during warm weather except for short distances, as lack of air circulation may cause abnormal deterioration.

HANDLING CABBAGE FOR SAUERKRAUT MANUFACTURE

About one-eighth of the total commercial cabbage crop is used for the manufacture of sauerkraut. The industry is confined mostly to producing States in the North, and about two-thirds of the total sauerkraut is manufactured in New York and Wisconsin. In general only domestic-type cabbage is used for sauerkraut, although at times part of the Danish crop is diverted to sauerkraut factories, especially if the domestic supply is inadequate.

Sauerkraut manufacturers prefer large, well-matured, closely trimmed heads for making a good-quality product. The larger the heads the less the waste. Large heads also make longer shreds, which are considered a requisite to high-quality sauerkraut. Frequently growers do not use enough care in handling cabbage intended for sauerkraut manufacture. Heads that are badly bruised by rough handling require closer trimming and involve greater waste, as bruised spots may become discolored before the heads can be shredded. A common complaint that sauerkraut manufacturers make against the handling practices of growers is the use of forks in loading and unloading. Unless a head is shredded very soon after a fork tine penetrates it the area surrounding the injury is likely to turn dark. Then unless the head is trimmed heavily the discoloration will show up in the manufactured product and lower its quality. Growers preferably should handle cabbage intended for sauerkraut manufacture by hand or should use wooden shovels or some other blunt tool that will not penetrate the heads in the loading and unloading.

United States standards for cabbage for sauerkraut manufacture were issued in 1932. During the war some cabbage was dehydrated; so the title of the standards was changed in 1944 to "United States Standards for Cabbage for Processing." These standards provide a basis for inspecting cabbage as it is delivered by the grower to a loading station or processing plant. The requirements for cabbage of U. S. No. 1 and U. S. No. 2 grades are specified in the standards.

At processing plants where official inspection is requested on the basis of the standards, representative samples are drawn from growers' loads by the inspector, who separates the individual heads and ascertains the percentage of U. S. No. 1, U. S. No. 2, and Cull heads. The value of the load is determined by applying these percentages to the prices established in the contract for each grade. The price established for U. S. No. 1 cabbage is more than the prevailing flat-rate contract price and the price for U. S. No. 2 is lower. Nothing is paid for the cull heads for they are supposed to be kept at home. This system of contracting for cabbage for processing on the basis of United States standards enables the growers to receive payment for the actual quality delivered, whereas under the flat-rate system growers of poor-quality cabbage are paid as much for a given quantity as growers of a high-quality product.

Copies of the latest United States standards for cabbage for processing may be obtained from the Production and Marketing Administration, Washington 25, D. C.

METHODS OF STORING CABBAGE

Only Danish or Hollander cabbage can be stored without excessive shrinkage. The bulk of the tonnage used for this purpose is grown in New York and Wisconsin. Houses for storing cabbage are more or less frostproof and are fitted with ventilators in the roof and along the walls at the ground. A driveway usually extends through the center of the house, with a row of bins along each side. These bins are commonly 3 to 4 feet in width, with double-slatted partitions between, so constructed as to give approximately 6 inches of ventilating space between the bins from top to bottom. In some

houses these compartments are considerably wider, in which case the cabbage is generally stored on slatted racks that fit into the bins. From one to four layers of heads are placed on each rack, and an air space of a few inches is left between the top layer of cabbages and the rack above. These racks aid greatly in the ventilation but add to the expense of handling and reduce the storage capacity of the house.

During severe weather it frequently is necessary to heat these storage houses. Stoves and coke heaters of the salamander type are used. If the open coke heater is used, the fire is lighted outside the building, and the salamander is moved inside after the smoke has cleared away. During severe weather or periods of wide fluctuations in temperature, storage houses require frequent attention.

Cabbage to be stored should be solid and should not show any yellowing, decay, mechanical injury, or other defects. If stored in these specially built warehouses, the heads should be trimmed to three to six tight wrapper leaves. Loose leaves interfere with ventilation, and thorough ventilation is essential to successful storage.

In some northern sections field storage is practiced extensively. The cabbage is cut with the stem one-half inch or more in length, leaving several loose wrapper leaves. The heads are placed one layer deep on well-drained sod land, closely packed together with the stems down. Then they are covered with a few inches of straw or hay, the depth of which is increased as the weather becomes colder.

Considerable quantities are held for short periods in barns or cellars, or piled outside in long ricks or against strawstacks. The cabbage is stacked 3 or 4 feet high against a ventilating rack or A-shaped frame and covered deeply with straw.

Upon removal from storage for shipment the stems are recut, and enough outer leaves are trimmed off to eliminate all defects and to give the heads a fresh appearance.

FEDERAL-STATE INSPECTION OF CABBAGE

Federal-State inspection of shipments of cabbage is available for a small fee to financially interested parties in most of the commercial cabbage-producing areas. Federal inspection is also available at receiving markets. Certificates are furnished to financially interested parties showing the grade and description of the shipment.

The use of official United States standards and the inspection service has greatly facilitated trading between shippers and dealers in the markets. The standards furnish a basis for contracts between sellers and buyers, and the inspection certificate indicates compliance or noncompliance with the quality provisions of contracts. Shipping-point certificates on shipments have discouraged receivers from making unwarranted rejections in the markets. The inspection certificate also aids in the settlement of disputes between shippers and buyers, and the detailed description of the shipment facilitates the settlement of damage claims against transportation companies. Federal-State and straight Federal certificates are accepted as prima facie evidence of the quality, grade, and condition of the shipment in all United States courts and in most State courts.

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